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Invasive alien species and other ocean stressors: Furthering the scientific knowledge and capacity basis in the Canary Current Large Marine Ecosystem

List of references

For the CCLME region

Non-native/invasive species in the CCLME

Bravo, I., Rodríguez, F., Ramilo, I. and Afonso-Carrillo, J. 2020. Epibenthic Harmful Marine Dinoflagellates from Fuerteventura (Canary Islands), with Special Reference to the Ciguatoxin-Producing *Gambierdiscus*. *J. Mar. Sci. Eng.* 8, 0909.
<https://doi.org/10.3390/jmse8110909>

Brehmer, P., Ndiaye, W., Mbaye, A., Fricke, A., Hess, P., Mertens, K., Chomerat, N., Ndour, I., Diedhiou, F., de Magny, G. C., Sonko, A., Faye, S. and Galgani, F. 2021. Découverte de la présence d'une toxine ayant un effet sur la santé humaine, émise par une micro-algue marine sur la presqu'île du Cap-Vert (Sénégal) : pollution marine, dégradation des habitats marins et effets du changement climatique en Afrique de l'Ouest [Projet AWAtox, dossier Ostreopsis, août 2021]. *Note Politique AWA*, CSRP-IRD, Dakar, 13 pp. Available at:
https://horizon.documentation.ird.fr/exl-doc/pleins_textes/2021-09/010082398.pdf
 (accessed 04 October 2021)

Brito, A. and Falcón, J. M. 1996. Capture of the St. Helena butterflyfish, *Chaetodon sanctaehelenae* (Chaetodontidae) in the Canary Islands. *Cybium* 20 (1): 99-100.

Brito, A. and Falcón, J. M. 2007. Primera cita para Canarias de dos nuevos peces de origen

tropical: *Diodon holocanthus* Linnaeus, 1758 y *Canthidermis maculata* (Bloch, 1786). *Revista de la Academia Canaria de Ciencias* 18 (4): 89-92.

Brito, A., Dorta, C. and Falcón, J. M. 2014. First valid record of *Gymnothorax vicinus* (Pisces: Muraenidae) for macaronesian ecoregion (Canary Islands): A process of tropicalization? 2014. *Revista de la Academia Canaria de Ciencias* 26: 71-78.

Brito, A., Falcón, J. M. and Herrera, R. 1995. Occurrence of the ocean triggerfish in the Eastern Atlantic (Canary Islands). *Journal of Fish Biology*, 47: 1099-1101.

Brito, A., Falcón, J. M. and Herrera, R. 2005. Sobre la tropicalización reciente de la ictiofauna litoral de las islas Canarias y su relación con cambios ambientales y actividades antrópicas [About the recent tropicalisation of the littoral ichthyofauna of the Canary Islands and its relationship with environmental changes and human activities]. *Vieraea* 33, 525-525. Available at: <https://www.museosdetenerife.org/assets/downloads/publication-d2b4f332eb.pdf>
 (accessed 01 September 2021).

Brito, A., Clemente, S. and Herrera, R. 2011. On the occurrence of the African hind, *Cephalopholis taeniops*, in the Canary

- Islands (eastern subtropical Atlantic): introduction of large-sized demersal littoral fishes in ballast water of oil platforms?. *Biol Invasions* 13, 2185.
<https://doi.org/10.1007/s10530-011-0049-0>
- Brito, A., López, C., Ocaña, O., Herrera, R., Moro, L., Monterroso, O., Rodríguez, A., Clemente, S. and Sánchez, J. J. 2017. Colonización y expansión en Canarias de dos corales potencialmente invasores introducidos por las plataformas petrolíferas [Colonization and expansion of two potentially invasive coral species in the Canary Islands introduced through oil platforms]. *Vieraea* 45, 65-82.
<https://doi.org/10.31939/vieraea.2017.45.04>
- Brito, A., Moreno-Borges, S., Escánez, A., Falcón, J. M. and Herrera, R. 2017. New records of Actinopterygian fishes from the Canary Islands: tropicalization as the most important driving force increasing fish diversity. *Rev. Acad. Canar. Cienc.* XXIX, 31-44.
- CAB International. 2004. *Prevention and Management of Alien Invasive Species: Forging Cooperation throughout West Africa*. Proceedings of a workshop held in Accra, Ghana, 9-11 March 2004. CAB International, Nairobi, Kenya.
- Castro, N., Carlton, J. T., Costa, A. C., Marques, C. S., Hewitt, C. L., Cacabelos, E., Lopes, E., Gizzi, Gestoso, I., Monteiro, J. G., Costa, J. L., Parente, M., Ramalhosa, P., Fofonoff, R., Chainho, P., Haroun, R., Santos, R. S., Herrera, R., Marques, T. A., Ruiz, G. M., Canning-Clode, J. 2022. Diversity and patterns of marine non-native species in the archipelagos of Macaronesia. *Diversity and Distributions*.
<https://doi.org/10.1111/ddi.13465>
- Castro-Hernández, J. J. 2001. First record of *Selene dorsalis* (Gill, 1862) (Osteichthyes: Carangidae) in the Canary Islands (Centraleast Atlantic). *Bol. Inst. Esp. Oceanogr.* 17 (3 and 4): 333-335.
- CCLME Project. 2016. Canary Current Large Marine Ecosystem (CCLME) Transboundary Diagnostic Analysis (TDA). CCLME Project Coordination Unit, Dakar, Senegal: 140 pp.
- Available at: <http://www.fao.org/3/a-br707e.pdf> (accessed 07 September 2021).
- Couce-Montero, L., Bilbao-Sieyro, A., Pérez-González, Y., Abramic, A. and Castro-Hernández, J. J. 2019. *Analysis of the professional fishing sector in Macaronesia under MSFD. Finding the Balance of Blue Growth Sustainable Development within Ecosystem Approach (Act. 2.1.1 c&d)*. GMR Canarias, S.A.U. & ECOAQUA-ULPGC. Report prepared as part of PLASMAR Project (co-financed by ERDF as part of POMAC 2014-2020). 120 pp. Available at:
https://accedacris.ulpgc.es/bitstream/10553/56367/2/Analysis%20of%20the%20professional%20fishing%20sector%20in%20Macaronesia%20under%20MSFD_PLASMAR%20Project.pdf
- Ministerio de Agricultura, Alimentación y Medio Ambiente. 2016. *Estrategias Marinas de España. Estudio Ambiental Estratégico. Evaluación Ambiental Estratégica*. Madrid. Available at:
https://www.miteco.gob.es/es/costas/temas/proteccion-medio-marino/eaeeeemmemoria_post_tcm30-497789.pdf
- Espino, F., Ramírez, B. and Brito, A. 2015. Occurrence of the Torroto Grunt, *Genyatremus cavifrons* (Cuvier, 1830) (Actinopterygii: Haemulidae) in the Canary Islands (Eastern Atlantic Ocean). *Revista de la Academia Canaria de Ciencias* 27: 91-97.
- Espino, F., Tuya, F. and Brito, A. 2015. Occurrence of the African sergeant, *Abudefduf hoefleri* (Steindachner, 1881) (Actinopterygii: Pomacentridae) in the Canary Islands waters. *Revista de la Academia Canaria de Ciencias* 27: 83-89.
- Espino, F., Tuya, F., del Rosario, A., Bosch, N. E., Coca, J., González-Ramos, A. J., del Rosario, F., Otero-Ferrer, F. J., Moreno, A. C. and Haroun, R. 2019. Geographical range extension of the Spotfin burrfish, *Chilomycterus reticulatus* (L. 1758), in the Canary Islands: A Response to Ocean Warming? *Diversity* 11(12), 230. <https://doi.org/10.3390/d11120230>
- Espino, F., Otero-Ferrer, F. J., Bosch, N. E., Coca, J., Haroun, R. and Tuya, F. 2020. Wide-spread demographic explosion of a non-

- indigenous hydrozoan on an oceanic island. *Sci. Mar.* 84(2), 000-000.
<https://doi.org/10.3989/scimar.04949.09A>
- Falcón, J. M. 2015. *Ictiofauna de las Islas Canarias. Análisis biogeográfico*. Tesis Doctoral (unpublished). Universidad de La Laguna.
- Falcón, J. M., Herrera, R., Ayza, O. and Brito, A. 2015. New species of tropical littoral fish found in Canarian waters. Oil platforms as central introduction vector. *Rev. Acad. Canar. Cienc.* XXVII, 67-82.
- Falcón, J. M., Brito, A., Herrera, R., Monterroso Hoyos, O., Rodríguez, M., Álvarez, O., Ramos, E. and Miguel, A. 2018. New records of tropical littoral fishes from the Canary Islands as a result of two driving forces: natural expansion and introduction by oil platforms. *Rev. Acad. Canar. Cienc.* XXX, 39-56.
- Falcón, J. M. and Monterroso Hoyos, O. 2018. *Caracterización y seguimiento de poblaciones de peces exóticos en el entorno del Puerto de Santa Cruz de Tenerife y áreas de la Red Natura próximas – Memoria Final*. Programa de Cooperación INTERREG V-A MAC 2014-2020. Dirección General de Protección de la Naturaleza Viceconsejería de Medio Ambiente del Gobierno de Canarias. Available at:
https://www.proyectomimarplus.com/wp-content/uploads/2020/09/SEGPECES_EXOT_TENERIFE_Mem_Final.pdf (accessed 01 September 2021).
- Falcón, J. M., Brito, A., Herrera, R., Ayza, O. and Moro, L. (in press). *Peces marinos tropicales exóticos en Canarias*. Gobierno de Canarias, Proyecto MIMAR (MAC/4.6d/066).
- García-Mederos, A. M. and Tuset, V. 2014. First record of African brown snapper *Lutjanus dentatus* in the Canary Islands (northeastern Atlantic Ocean). *Marine Biodiversity Records* 7, e65: 1-3.
<https://doi.org/10.1017/S1755267214000682>
- González, J. A., Triay-Portella, R., Escribano, A. and Cuesta, J. A. 2017. Northernmost record of the pantropical portunid crab *Cronius ruber* in the eastern Atlantic (Canary Islands): natural range extension or human-mediated introduction? *Sci. Mar.* 81(1), 81-89.
<http://dx.doi.org/10.3989/scimar.04551.17B>
- González, J. A. and Santana, J. I. 1986. Sobre la presencia de *Lutjanus goreensis* (Valenciennes, 1830) (Osteichthyes: Lutjanidae) en aguas de Canarias. *Vieraea* (16): 283-286.
- González, J. A., González-Jiménez, J. F., Triay-Portella, R., Jiménez, S., González-Lorenzo, G. and Biscoito, M. 2016. On the presence of *Trachinus pellegrini* (Trachinidae) in the Canary and Cape Verde Islands (north-eastern Atlantic). *Cybium* 40(2): 173-177.
- Inejih, C. A., Mahfoudh, O. T. S. and Diadhiou, H. D. 2014. *Assessment of the state of marine biodiversity in the region of the CCLME – Study report*. Canary Current Large Marine Ecosystem Project (CCLME). Available at:
<http://www.fao.org/3/br707e/br707e.pdf> (accessed 01 September 2021)
- López, C., Clemente, S., Moreno, S., Ocaña, O., Herrera, R., Moro, L., Monterroso, O., Rodríguez, A. and Brito, A. 2019. Invasive *Tubastraea* spp. and *Oculina patagonica* and other introduced scleractinians corals in the Santa Cruz de Tenerife (Canary Islands) harbor: Ecology and potential risks. *Regional Studies in Marine Science* 29, 100713.
<https://doi.org/10.1016/j.rsma.2019.100713>
- Martin, J., Triay-Portella, R., Pajuelo, J. G., Nespereira, J., González, J., Luque, A. and Izquierdo, I. 2019. Sampling techniques evaluation for monitoring and control of a non-native crab population. *Frontiers in Marine Science* 6.
https://doi.org/10.3389/conf.fmars.2019.08_00110
- Monterroso, O. and Falcón, J. M. 2018. *Caracterización y seguimiento de poblaciones de peces exóticos en el entorno del Puerto de Las Palmas y áreas de la Red Natura próximas – Memoria Final*. Proyecto MIMAR (MAC/4.6D/066) Viceconsejería de Medio Ambiente del Gobierno de Canarias. Dirección General de Protección de la Naturaleza. 88 pp. Available at:
<https://www.proyectomimarplus.com/caracterizacion-y-seguimiento-de-poblaciones-de->

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8330033/> (accessed 04 October 2021).
- Moreno-Borges, S., Escánez, A. and Brito, A. 2019. First occurrence of the blackspot conger, *Paraconger macrops* (Actinopterygii: Anguilliformes: Congridae), in the waters of the Canary Islands: A comparative study of eastern Atlantic Paraconger species. *Acta Ichthyologica et Piscatoria; Szczecin* 49(1), 89-93. <https://doi.org/10.3750/AIEP/02518>
- Otero-Ferrer, F., Herrera, R., López, A., Socorro, J., Molina, L. and Bouza, C. 2015. First records of *Hippocampus algiricus* in the Canary Islands (north-east Atlantic Ocean) with an observation of hybridization with *Hippocampus hippocampus*. *Journal of Fish Biology* 87(4), 1080-1089. <https://doi.org/10.1111/jfb.12760>
- Oussellam, M., Benhoussa, A., Pariselle, A., Rahmouni, I., Salmi, M., Agnes, J. F., Selfati, M., El Ouamari, N. and Bazairi, H. 2021. First and southern-most records of the American blue crab *Callinectes sapidus* Rathbun, 1896 (Decapoda, Portunidae) on the African Atlantic coast. *Acta Oceanologica Sinica, under review*.
- Pajuelo, J. G., González, J. A., Triay-Portella, R., Martín, J. A., Ruiz-Díaz, R., Lorenzo, J. M. and Luque, A. 2016. Introduction of non-native marine fish species to the Canary Islands waters through oil platforms as vectors. *Journal of Marine Systems* 163, 23-30. <https://doi.org/10.1016/j.jmarsys.2016.06.008>
- Ramírez, B., Ortega, L., Montero, D., Tuya, F. and Haroun, R. 2015. Monitoring a Massive Escape of European Sea Bass (*Dicentrarchus labrax*) at an Oceanic Island: Potential Species Establishment. *J. Aquac. Res. Development* 6, 339. <https://doi.org/10.4172/2155-9546.1000339>
- Rico, V., Santana, J. I. and González, J. A. 1995. Ocurrence of *Dentex* (*Polysteganus angolensis* Poll and Maul, 1953 (Sparidae) in the Canary Islands. *Cybium* 19 (4): 323-432.
- Riera, R., Espino, F. and Moro, L. 2016. Progressing the invasion of the hydrozoan *Macrorhynchia philippina* (Kirchenpauer, 1872) in the Atlantic archipelagos. *Vieraea* 44, 117-120.
- Rosa González, L. G. 2020. *Nuevas especies en el medio marino de Canarias: Vías de introducción*. [New species in the marine environmental of the Canary Islands: Introduction routes]. Trabajo de Fin de Grado. University of La Laguna. Available at: <https://riull.ull.es/xmlui/bitstream/handle/915/21703/Nuevas%20especies%20en%20el%20medio%20marino%20de%20Canarias%20Ovias%20de%20introduccion..pdf?sequence=1&isAllowed=y> (accessed 01 September 2021).
- Ruiz-Díaz, R., Triay-Portella, R., González, J., Luque, A., Lorenzo, J. and Pajuelo, J. 2016. Reproductive capability of non-indigenous species introduced in Gran Canaria associated to oil platforms. *Front. Mar. Sci. Conference Abstract: XIX Iberian Symposium on Marine Biology Studies*. <https://doi.org/10.3389/conf.FMARS.2016.05.00189>
- Sabour, B., Reani, A., Magouri, H. E. L. and Haroun, R. 2013. Sargassum muticum (Yendo) Fensholt (Fucales, Phaeophyta) in Morocco, an invasive marine species new to the Atlantic coast of Africa. *Aquatic invasions* 8 (1), 97-102. <http://dx.doi.org/10.3391/ai.2013.8.1.11>
- Soler-Onís, E., Fernández Zabala, J., Ojeda-Rodríguez, A. and Amorim, A. 2016. Bloom of *Gambierdiscus caribaeus* in the temperate-subtropical waters of El Hierro, Canary Islands (North East Atlantic). *Harmful Algae News* 55, 14–16. <http://www.e-pages.dk/ku/1259> (accessed 04 October 2021)
- Soler Onís, E., Fernández Zabala, J. and Ramirez, A. S. 2019. First records of *Gambierdiscus excentricus* and *Ostreopsis lenticularis* in the Cape Verde Archipelago (Macaronesia, Central Eastern Atlantic). *Harmful Algae News* 65, 8-9. Available at: <http://www.e-pages.dk/ku/1439> (accessed 09 September 2021).
- Spain. 2013. Real Decreto 630/2013, de 2 de agosto, por el que se regula el Catálogo español de especies exóticas invasoras. *Boletín Oficial del Estado*, 3 August 2013, No. 185. Available at:

- <https://www.boe.es/eli/es/rd/2013/08/02/630/con> (accessed 02 November 2021).
- Spain. 2019. Real Decreto 216/2019, de 29 de marzo, por el que se aprueba la lista de especies exóticas invasoras preocupantes para la región ultraperiférica de las islas Canarias y por el que se modifica el Real Decreto 630/2013, de 2 de agosto, por el que se regula el Catálogo español de especies exóticas invasoras. *Boletín Oficial del Estado*, 30 March 2019, No. 77, 32902-32921. Available at: <https://www.boe.es/eli/es/rd/2019/03/29/216> (accessed 02 November 2021).
- Toledo-Guedes, K., Sanchez-Jerez, P., Mora-Vidal, J., Girard D. and Brito, A. 2012. Escaped introduced sea bass (*Dicentrarchus labrax*) infected by *Sphaerospora testicularis* (Myxozoa) reach maturity in coastal habitats off Canary Islands. *Marine ecology* 33(1), 26-31. <https://doi.org/10.1111/j.1439-0485.2011.00470.x>
- Toledo-Guedes, K., Sanchez-Jerez, P. and Brito, A. 2013. Influence of a massive aquaculture escape event on artisanal fisheries. *Fisheries Management and Ecology* 21(2), 113-121. <https://doi.org/10.1111/fme.12059>
- Toledo-Guedes, K., Sanchez-Jerez, P., Brito, A. 2014. Farming-up coastal fish assemblages through a massive aquaculture escape event. *Marine Environmental Research* 98, 86-95. <https://doi.org/10.1016/j.marenvres.2014.03.009>
- Triay-Portella, R., Pajuelo, J. G., Manent, P., Espino, F., Ruiz-Díaz, R., Lorenzo, J. M. and González, J. A. 2015. New records of non-indigenous fishes (Perciformes and Tetraodontiformes) from the Canary Islands (north-eastern Atlantic). *Cybium* 39(3), 163-174. Available at: <https://sfi-cybium.fr/en/new-records-non-indigenous-fishes-perciformes-and-tetraodontiformes-canary-islands-north-eastern> (accessed 01 September 2021).
- Verlaque, M., Afonso-Carrillo, J., Gil-Rodríguez, M. C., Durand, C., Boudouresque, C. F. and Le Parco, Y. 2004. Blitzkrieg in a marine invasion: *Caulerpa racemosa* var. *cylindracea* (Bryopsidales, Chlorophyta) reaches the Canary Islands (north-east Atlantic). *Biological Invasions* 6(3), 269-281. <https://doi.org/10.1023/B:BINV.0000034589.18347.d3>

Biogeographical units/patterns

- Almada, V. C., Falcón, J. M., Brito, A., Levy, A., Floeter, S., Robalo, J. I. and Almada, F. 2013. Complex origins of the Lusitania biogeographic province and northeastern Atlantic fishes. *Frontiers of biogeography*, 5 (1): 20-28. Research Letter.
- Ávila, S. P., Cordeiro, R., Madeira, P., Silva, L., Medeiros, A., Rebelo, A. C., Melo, C., Neto, A. I., Haroun, R., Monteiro, A., Rijsdijk, K. and Johnson, M. E. 2018. Global change impacts on large-scale biogeographic patterns of marine organisms on Atlantic oceanic islands. *Marine Pollution Bulletin* 126, 101-112 pp. <https://doi.org/10.1016/j.marpolbul.2017.10.087>
- Báez, J., Rodríguez-Cabello, C., Bañón, R., Brito, A., Falcón, J., Maño, T., Baro, J., Macías, D., Meléndez, M., Camiñas, J., Arias-García, A., Gil, J., Farias, C., Artexe, I., and Sánchez, F. 2019. Updating the national checklist of marine fishes in Spanish waters: An approach to priority hotspots and lessons for conservation. *Mediterranean Marine Science* 20(2), 260-270. <http://dx.doi.org/10.12681/mms.18626>
- Floeter, S. R., Rocha, L. A., Robertson, D. R., Joyeux, J. C., Smith-Vaniz, W. F., Wirtz, P., Edwards, A. J., Barreiros, J. P., Ferreira, C. E. L., Gasparini, J. L., Brito, A., Falcón, J. M., Bowen, B. W. and Bernardi, G. 2008. Atlantic reef fish biogeography and evolution. *Journal of Biogeography* 35, 22-47.
- Freitas, R., Romeiras, M., Silva, L., Cordeiro, R., Madeira, P., González, J. A., Wirtz, P., Falcón, J. M., Brito, A., Floeter, S. R., Afonso, P., Porteiro, F., Viera-Rodríguez, M. A., Neto, A. I., Haroun, R., Farminhão, J. N. M., Rebelo, A. C., Baptista, L., Melo, C.

S., Martínez, A., Núñez, J., Berning, B., Johnson, M. E. and Ávila, S. P. 2019. Restructuring of the ‘Macaronesia’ biogeographic unit: A marine multi-taxon

biogeographical approach. *Sci. Rep.* 9, 15792. <https://doi.org/10.1038/s41598-019-51786-6>

Ocean conditions / other stressors in the CCLME

Jouffre, D., Domalain, G., Traoré, S., Thiam, D., Domain, F. and Inejih C. A. 2004. Détection de l'impact de la pêche sur les communautés démersales d'Afrique de l'Ouest par l'analyse multivariée sous contraintes. In: Chavance, Pierre, Moctar, B. and Gascuel, D. (eds). *Symposium International : Pêches Maritimes, Ecosystèmes et Sociétés en Afrique de l'Ouest : Un Demi Siècle de Changement [Marine fisheries, ecosystems and societies in West Africa: half a century of change]*. Bruxelles : Office des Publications Officielles des Communautés Européennes, 15, 421-432. (Rapport de

Recherche Halieutique ACP-UE ; 1). Available at: <https://www.documentation.ird.fr/hor/fdi:010045946> (accessed 18 October 2021). Siemer, J. P., Machín, F., González-Vega, A., Arrieta, J. M., Gutiérrez-Guerra, M. A., Pérez-Hernández, M. D., Vélez-Belchí, P., Hernández-Guerra, A. and Fraile-Nuez, E. 2021. Recent trends in SST, Chl-a, productivity and wind stress in upwelling and open ocean areas in the upper Eastern North Atlantic subtropical gyre. *Journal of Geophysical Research: Oceans* 126, e2021JC017268. <https://doi.org/10.1029/2021JC017268>

Other relevant references

Bioinvasions and threatened species

Azzurro, E., Tuset, V. M., Lombarte, A., Maynou, F., Simberloff, D., Rodríguez-Pérez, A. and Solé, R. V. 2014. External morphology explains the success of biological invasions. *Ecology Letters* 17(11). <https://doi.org/10.1111/ele.12351>

[14/cop-14-dec-11-en.pdf](https://doi.org/10.1111/ele.12351) (accessed 21 December 2021).

Castro, N., Ramalhosa, P., Jiménez, J., Lino Costa, J., Gestoso, I. and Canning-Clode, J. 2020. Exploring marine invasions connectivity in a NE Atlantic Island through the lens of historical maritime traffic patterns. *Regional Studies in Marine Science* 37, 101333. <https://doi.org/10.1016/j.rsma.2020.101333> 2352-4855

de Castro M. C. T., Fileman T. W., Hall-Spencer J. M. 2017. Invasive species in the Northeastern and Southwestern Atlantic Ocean: A review. *Mar. Pollut. Bull.* 116, 41-47. <https://doi.org/10.1016/j.marpolbul.2016.12.048>

Convention on Biological Diversity. 2018. Decision adopted by the Conference of the Parties to the Convention on Biological Diversity. Conference of the Parties to the Convention on Biological Diversity, fourteenth meeting. CBD/COP/DEC/14/11. Sharm El-Sheikh, Egypt. Available at: <https://www.cbd.int/doc/decisions/cop-14/11/>

Diogoul, N., Brehmer, P., Demarcq, H., ElAyoubi, S., Thiam, A., Sarre, A., Mouget, A. and Perrot, Y. 2021. On the robustness of an eastern boundary upwelling ecosystem exposed to multiple stressors. *Scientific reports*, 11:1908. <https://doi.org/10.1038/s41598-021-81549-1>

IUCN. 2020. In *IUCN Red List of Threatened Species*. <https://www.iucnredlist.org/en>

Molnar, J. L., Gamboa, R. L., Revenga, C. and Spalding, M. D. 2008. Assessing the global threat of invasive species to marine biodiversity. *Frontiers in Ecology and the*

- Environment* 6(9).
<https://doi.org/10.1890/070064>
- Farré, M., Lombarte, A., Tuset, V. M. and Abelló, P. 2021. Shape matters: relevance of carapace for brachyuran crab invaders. *Biol Invasions* 23, 461–475.
<https://doi.org/10.1007/s10530-020-02378-3>
- Landeira, J. M., Liu, B., Omura, T., Akiba, T. and Tanaka, Y. 2020. Salinity effects on the first larval stage of the invasive crab *Hemigrapsus takanoi*: Survival and swimming patterns. *Estuarine, Coastal and Shelf Science* 245, 106976,
<https://doi.org/10.1016/j.ecss.2020.106976>
- Sempere-Valverde, J., Pellón, J. G., Bazairi, H., Ostalé-Valriberas, E., Espinosa Torre, F. and García-Gómez, J. 2016. Observations and spread of the invasive algae *Caulerpa cylindracea* on the Strait of Gibraltar. *Front. Mar. Sci. Conference Abstract: XIX Iberian Symposium on Marine Biology Studies.* https://doi.org/10.3389/conf.FMAR_S.2016.05.00186
- Tuset, V. M., Lombarte, A., Bariche, M., Maynou, F., Azzurro, E., 2020. Otolith morphological divergences of successful Lessepsian fishes on the Mediterranean coastal waters, *Estuarine, Coastal and Shelf Science* 236, 106631.
<https://doi.org/10.1016/j.ecss.2020.106631>
- Zhang, Z., Capinha, C., Usio, N., Weterings, R., Liu, X., Li, Y., Landeira, J. M., Zhou, Q. and Yokota, M. 2020. Impacts of climate change on the global potential distribution of two notorious invasive crayfishes. *Freshwater biology* 65(3).
<https://doi.org/10.1111/fwb.13429>

Other Ocean Stressors

- Baldé, B. S., Diadhiou, H. D., Sow, F. N., Fall, M. and Brehmer, P. 2019. Dynamique du Yabóy mérèg et du Cobo au Sénégal dans un contexte de changement climatique : diagnostic et synthèse bioécologiques. *Les Notes Politiques de l'ISRA-BAME*. Dakar : ISRA-BAME, 4 pp. Available at:
<https://www.documentation.ird.fr/hor/fdi:010076716> (accessed 18 October 2021)
- Lachkar, Z. and Gruber, N. 2012. Exploring the Future Evolution of Multiple Stressors in Eastern Boundary Upwelling Systems. *Ocean Carbon and Biogeochemistry News*. 5, 5-9.
- Maureaud, A., Frelat, R., Pécuchet, L., Shackell, N., Mérigot, B., Pinsky, M. L., Amador, A., Anderson, S. C., Arkhipkin, A., Auber, A., Barri, I., Bell, R., Belmaker, J., Beukhof, E., Lamine Camara, M., Guevara-Carrasco, R., Choi, J., Christensen, H. T., Conner, J., Cubillos, L. A., Diadhiou, H. D., et al. 2021. Are we ready to track climate-driven shifts in marine species across international boundaries? - A global survey of scientific bottom trawl data. *Global Change Biology* 27(2), 220-236.
<https://doi.org/10.1111/gcb.15404>
- Poloczanska, E. S., Burrows, M. T., Brown, C. J., García Molinos, J., Halpern, B. S., Hoegh-Guldberg, O., Kappel, C. V., Moore, P. J., Richardson, A. J., Schoeman, D. S. and Sydeman, W. J. 2016. Responses of Marine Organisms to Climate Change across Oceans. *Front. Mar. Sci.* 3, 62.
<https://doi.org/10.3389/fmars.2016.00062>
- Riebesell, U., Aberle-Malzahn, N., Achterberg, E. P., Algueró-Muñiz, M., Alvarez-Fernandez, S., Arístegui, J., Bach, L. T., Boersma, M., Boxhammer, T., Guan, W., Haunost, M., Horn, H. G., Löscher, C. R., Ludwig, A., Spisla, C., Sswat, M., Stange, P. and Taucher, J. 2018. Toxic algal bloom induced by ocean acidification disrupts the pelagic food web. *Nature Climate Change* 8, 1082–1086. <https://doi.org/10.1038/s41558-018-0344-1>
- UNEP-MAP RAC/SPA, 2009. *Identification of important ecosystem properties and assessment of ecological status and pressures to Mediterranean marine and coastal biodiversity*. Bazairi, H., Ben Haj, S., Torchia, G., Limam, A., Rais, C. and Cebrian, D. (eds). RAC/SPA, Tunis, 100 pp.

Species distribution databases and tools

Banco de datos de biodiversidad de Canarias (BDBC) [Biodiversity data bank of the Canary Islands]: <https://www.biodiversidadcanarias.es/biota>

Information about citation at: <https://www.biodiversidadcanarias.es/biota/normas>

Especies introducidas de Canarias: <https://www.biodiversidadcanarias.es/exos>

European Alien Species Information Network (EASIN): <https://easin.jrc.ec.europa.eu/easin>

Trombetti, M., Katsanevakis, S., Deriu, I. and Cardoso, A. C. 2013. EASIN-Lit: a geo-database of published alien species records. *Management of Biological Invasions* 4(3), 261-264.
<http://dx.doi.org/10.3391/mbi.2013.4.3.08>

Global Invasive Species Database (GISD): <http://www.iucngisd.org/gisd>

Pagad, S., Genovesi, P., Carnevali, L., Scalera, R. and Clout, M. 2015. IUCN SSC Invasive Species Specialist Group: invasive alien species information management supporting practitioners, policy makers and decision takers. *Management of Biological Invasions* 6(2), 127–135.
<http://dx.doi.org/10.3391/mbi.2015.6.2.03>

MarINVaders toolkit: <https://marinvaders.gitlab.io/marinvaders>

Lonka, R., Verones, F. and Stadler, K. 2021. The MarINVaders Toolkit. *Journal of Open Source Software* 6(64), 3575. <https://doi.org/10.21105/joss.03575>

Ocean Biodiversity Information System (OBIS): <https://obis.org>

OBIS. 2021. *Ocean Biodiversity Information System*. Intergovernmental Oceanographic Commission of UNESCO. www.obis.org

Red de Alerta Temprana de Canarias para la Detección e Intervención de Especies Exóticas Invasoras (RedEXOS) del Gobierno de Canarias [Canary Islands' Early Warning Network for the detection of Invasive Alien Species]:

<https://www3.gobiernodecanarias.org/cptss/sostenibilidad/biodiversidad/redexos/app/map>

Red de Observadores del Medio Marino de Canarias (RedPROMAR) [The Observer Network of the Marine Environment of the Canary Islands]: <https://redpromar.org>

World Register of Introduced Marine Species (WRiMS):

<http://www.marinespecies.org/introduced>

Rius, M., Ahyong, S., Costello, M. J., Galil, B. S., Gollasch, S., Hutchings, P., Katsanevakis, S., Lejeusne, C., Marchini, A., Occhipinti, A., Pagad, S., Poore, G. C. B., Robinson, T. B., Sterrer, W., Turon, X., Willan, R. C. and Zhan, A. 2021. *World Register of Introduced Marine Species (WRiMS)*. <https://doi.org/10.14284/347>

World Register of Marine Species (WoRMS): <https://www.marinespecies.org>

WoRMS Editorial Board (2021). World Register of Marine Species. Available from
<http://www.marinespecies.org> at VLIZ. Accessed yyyy-mm-dd. <https://doi.org/10.14284/170>

or

Horton, T., et al. 2021. World Register of Marine Species. Available from
<https://www.marinespecies.org> at VLIZ. Accessed 2021-09-07. doi:10.14284/170

[Full citation at: <https://www.marinespecies.org/aphia.php?p=popup&name=citation>]